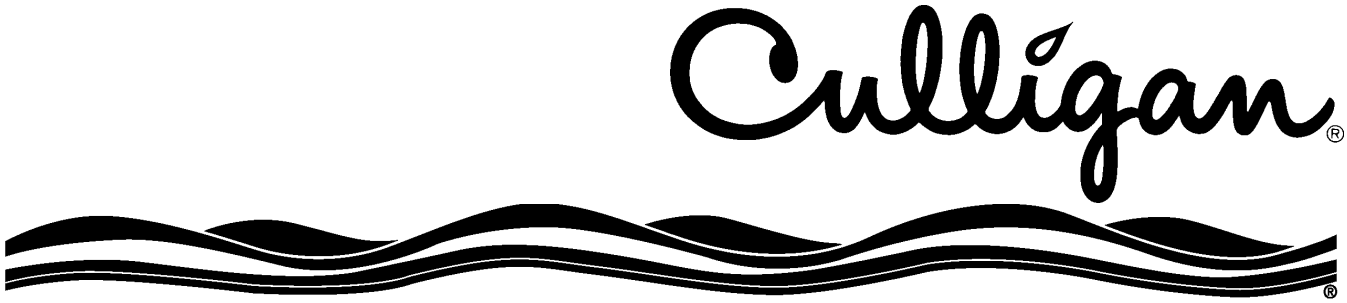
Cat. No. 01-8820-13
Rev. B 12/31/01
DCO-3296




# CULLIGAN® MARK 100 WATER SOFTENER SERVICE MANUAL

## Models from 1998

**⚠ WARNING: IF INCORRECTLY INSTALLED, OPERATED OR MAINTAINED, THIS PRODUCT CAN CAUSE SEVERE INJURY. THOSE WHO INSTALL, OPERATE, OR MAINTAIN THIS PRODUCT SHOULD BE TRAINED IN ITS PROPER USE, WARNED OF ITS DANGERS, AND SHOULD READ THE ENTIRE MANUAL BEFORE ATTEMPTING TO INSTALL, OPERATE OR MAINTAIN THIS PRODUCT.**

CULLIGAN COMPANY
NORTHBROOK, ILLINOIS 60062

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***Attention Culligan Customer:***

The installation, service and maintenance of this equipment should be rendered by a qualified and trained service technician. Your local independently operated Culligan dealer employs trained service and maintenance personnel who are experienced in the installation, function and repair of Culligan equipment. This publication is written specifically for these individuals and is intended for their use.

We encourage Culligan users to learn about Culligan products, but we believe that product knowledge is best obtained by consulting with your Culligan dealer. Untrained individuals who use this manual assume the risk of any resulting property damage or personal injury.

**⚠ WARNING - Prior to servicing equipment, disconnect power supply to prevent electrical shock.**

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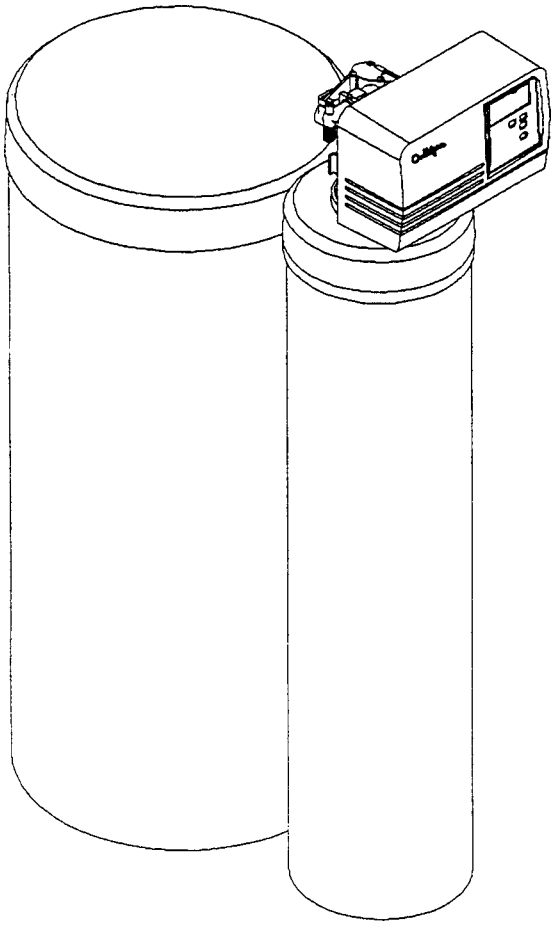

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# Introduction

## SAFE PRACTICES

Throughout this manual there are paragraphs set off by special headings.

NOTICE: Notice is used to emphasize installation, operation or maintenance information which is important, but does not present any hazard.

Example: NOTICE: *The nipple must extend no more than 1 inch above the cover plate.*

⚠ **CAUTION**: Caution is used when failure to follow directions could result in damage to equipment or property.

Example: ⚠ **CAUTION: *Disassembly while under water pressure can result in flooding.***

⚠ **WARNING**: Warning is used to indicate a hazard which could cause injury or death if ignored.

Example: ⚠ **WARNING! ELECTRICAL SHOCK HAZARD! UNPLUG THE UNIT BEFORE REMOVING THE TIMER MECHANISM OR COVER PLATES!**

## SERIAL NUMBERS

The control valve serial number, is on the back of the timer case.

The media tank serial number is on the top edge of the tank side wall.

NOTICE: *Do not remove or destroy the serial number. It must be referenced on request for warranty repair or replacement.*

This booklet is designed and organized to assist the service technician in developing a systematic service call approach for the Culligan® Mark 100 water softeners.

Included are suggestions on preventive and periodic maintenance, recommended tools for servicing equipment with the motorized valve, and specific service procedures. Also, technical information on flow rates, settings, critical dimensions, wiring and flow schematics are included.

This publication is based on information available when approved for printing. Continuing design refinement could cause changes that may not be included in this publication.

# Specifications

**Culligan® Mark 100 Water Conditioners with Time Clock, Aqua-Sensor® Device or Soft-Minder® Meter**

| | 9” Model | 12” Model |
|---|---|---|
| Control Valve | 5-cycle, Reinforced Thermoplastic | 5-cycle, Reinforced Thermoplastic |
| Overall Conditioner Height | 51 in | 51 in |
| | 1 295 mm | 1 295 mm |
| Media Tank Dimensions (Dia x Ht) | 9 x 45 in | 12 x 45 in |
| | 229 x 1 143 mm | 305 x 1 143 mm |
| Salt Storage Tank Dimensions (Dia x Ht) | 16 x 43 in | 18 x 43 in |
| | 457 x 1 092 mm | 457 x 1 092 mm |
| | 18 x 43 in | |
| | 457 x 1092 mm | |
| Exchange Media, Type and Quantity | Cullex® Media, 0.86 $ft^3$ | Cullex Resin, 1.4 $ft^3$ |
| | Cullex Media, 24.5 L | Cullex Resin, 40 L |
| Underbedding, Type and Quantity | Cullsan® Underbed, 12 lb | Cullsan Underbed, 30 lb |
| | Cullsan Underbed, 5.4 kg | Cullsan Underbed, 14 kg |
| Exchange Capacity | 16,200 gr @ 4.0 lb | 27,700 gr @ 6.0 lb |
| @ Salt Dosage Per Recharge[1] | 1 050 gr @ 1.6 kg | 1 795 gr @ 3 kg |
| | 23,900 gr @ 8.0 lb | 35,200 gr @ 12.0 lb |
| | 1 549 gr @ 3.2 kg | 2 280 gr @ 5.3 kg |
| | 24,700 gr @ 12.0 lb | 40,300 gr @ 18.0 lb |
| | 1 601 gr @ 5.4 kg | 2 611 gr @ 8.1 kg |
| Freeboard to Media[2] | 16.6-17.6 in | 17.5-18.5 in |
| | 420-450 mm | 444-470 mm |
| Freeboard to Underbedding[3] | 39.2 in | 38.5 in |
| | 996 mm | 978 mm |
| Salt Storage Capacity | 250 lb or 375 lb | 375 lb |
| | 114 kg or 170 kg | 170 kg |
| Rated Service Flow @ Pressure Drop | 7.5 gpm @ 15 psi | 7.5 gpm @ 15 psi |
| | 30 Lpm @ 102 kPa | 31 Lpm @ 102 kPa |
| Total Hardness, Maximum | 50 gpg | 75 gpg |
| | 1 300 mg/L | 1700 mg/L |
| Total Iron, Maximum | 5 ppm | 5 ppm |
| | 5 mg/L | 5 mg/L |
| Hardness to Iron Ratio, Minimum[4] | 8 gpg to 1 ppm | 8 gpg to 1 ppm |
| | 140 mg/L to 1 mg/L | 140 mg/L to 1 mg/L |
| Operating Pressure | 20-125 psi | 20-125 psi |
| | 140-860 kPa | 140-860 kPa |
| Operating Temperature | 33-120°F | 33-120°F |
| | 1-50°C | 1-50°C |
| Electrical Requirements | 120V/60 Hz | 120V/60 Hz |
| Electrical Power Consumption, Min/Max | 3 Watts/35 Watts | 3 Watts/35 Watts |
| Drain Flow, Maximum[5] | 2.0 gpm | 3.5 gpm |
| | 8 L/pm | 14 L/pm |
| Recharge Time, Average[6] | 80 min | 85 min |
| Recharge Water Consumption, Average | 45 gal | 86 gal |
| | 170 L | 325 L |

1 Capacities and corresponding salt dosages pertain to low hardness waters. Capacities given are per recharge
2 Measured from top of media to top of inlet fitting (backwashed and drained).
3 Measured from top of underbedding to top of inlet fitting.
4 Hardness to iron ratio does not apply and total hardness and iron specifications change as follows when Sofner-Gard® accessory is used: 9" Model - 50 gpg (855 mg/L) total hardness, 10 ppm (mg/L) iron; 12" Model - 75 gpg (1 200 mg/L) hardness, 20 ppm (20 mg/L) iron.
5 Backwash at 120 psi (830 kPa).
6 10 minute backwash, 7 lb (3.2 kg) 9” model or 13 lb (5.9 kg) 12” model salt dosage at 30 psi (204 kPa).

# Familiarization

## CONTROL

The Culligan® Mark 100 water softener uses the same power valve control as in our Culligan Mark 89/812 models. It can be programmed as either a time clock, Aqua-Sensor® sensing device or Soft-Minder® meter model. Each model has its own programming parameters which can be set to control the operation and regeneration of the system. These are outlined in Table 1.

**TABLE 1**

| FUNCTION | TIME CLOCK | SOFT-MINDER METER | AQUA-SENSOR SENSING DEVICE |
|---|---|---|---|
| 1. Time of Day | YES | YES | YES |
| 2. Time of Regen. | YES | YES | YES |
| 3. Not Used | NO | NO | NO |
| 4. Salt Dosage | YES | YES | YES |
| 5. Backwash Time | YES | YES | YES |
| 6. Brine Rinse Time | YES | YES | NO |
| 7. Hardness Level | NO | YES | NO |
| 8. Gallons Capacity - Regeneration Interval | YES | YES | NO |
| 9. Lock/Unlock display | YES | YES | YES |
| 10. Blanking Feature | YES | YES | YES |

During the programming stage, the user will be prompted to enter the appropriate parameter. Refer to Programming, page 9 for further information.

## CIRCUIT BOARD

The AccuSoft™ microprocessor circuit board controls every function of the Culligan Mark 100 water softener. This board has several unique features which allow it to perform a variety of functions. Familiarization of the board is essential for a thorough understanding of the softener.

⚠ **CAUTION:** ***The AccuSoft circuit board must be handled by its edges to prevent damage to the circuitry. Mishandling of the circuit board will void the warranty. Keep replacement boards in their special anti-static plastic bags until ready for use.***

### Programming Switches

The circuit board will require the proper setting of the dip switches in order to function properly.

Switch 1 - Sets the unit in the Run or Test mode.
Switch 2 - Sets the unit for Filter or Softener. (Not activated for North American units)
Switch 3 - Multiple gallons read out by 10 or 100. (Currently not used on household systems)
Switch 4 - Sets the tanks for 9” or 12”.
Switch 5 - In the OFF position, the unit will have the standard Refill cycle. In the ON position, the unit has an accelerated Refill cycle. (If an accelerated Refill cycle is chosen, the refill flow control in the brine refill assembly must be changed to PN 00-4016-23)
Switch 6 - When turned ON, this will allow an immediate regeneration upon a signal from the Soft-Minder® Meter and Aqua Sensor® sensing device. When the switch is in the OFF position, a delayed regeneration will occur.
Switch 7 - In the ON position, the softener will measure in liters and either French degree’s or German degree’s. In the OFF position, the conventional English parameters are used.
Switch 8 - Sets the unit to display time as military time or Standard 12 hour clock.

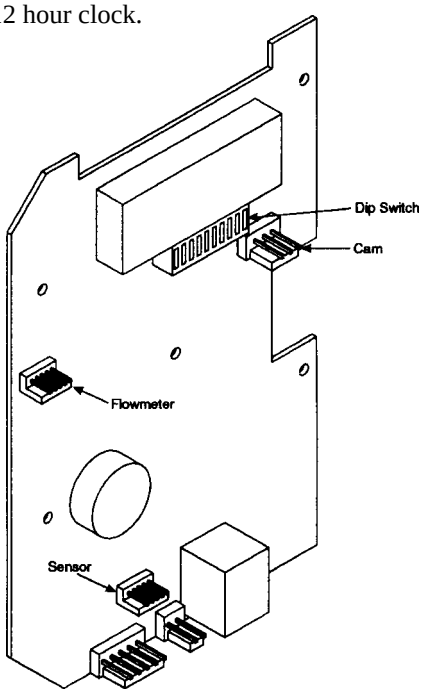



**FIG. 1**

Switch 9 - When Switch number 7 is turned ON, switch number 9 must be set to either German or French degrees'. If Switch number 7 is Off, switch number 9 will not be used.

Switch 10 - When turned ON, the softener will regenerate every third day if a regeneration has not occurred within the three day interval. (Used only for Aqua-Sensor or Soft Minder models.)

### Auxiliary Connections

Refer to Fig. 1. Aqua-Sensor sensing device connections are located in the lower area of the board, the Soft-Minder connections are to the left side of the board. Power terminals are located along with lower mid section of the board. They are marked from left to right as neutral, motor neutral ground, and motor common. Connections for the motor homing and program microswitch are located to the above right of the power leads. All terminals are clearly marked for easy installation.

### Display Blanking

As shipped from the factory, the display of the board will turn off if there has been no key board activity for a 1 minute period. To have the display constantly lit, press the STATUS button until the number 10 icon is lit. Next, press the UP and DOWN arrows simultaneously. A "d" for disable will appear in the display. To have the display blank again , press the UP and DOWN arrows simultaneously. An "E" will appear in the display .

### Display Lockout

The Culligan® Mark 100 control is equipped with a new feature which will allow you to protect the programmed settings from tampering by unauthorized individuals. When the lockout feature is activated, the only parameter which can be adusted is the Time of Day.

To activate the lockout feature, press the STATUS button until the number 9 icon is illuminated. A "U" for unlock will be displayed. Press the UP and DOWN arrows simultaneously. A "L" for lock will appear along with an icon of a lock. All program parameters, except time of day, are now frozen at their current settings. To disable this feature, press the UP and DOWN arrows simultaneously.

### Power Loss

The AccuSoft™ circuit board is equipped with a capacitor, which in the event of a power outage will maintain all the programming parameters and time-of-day for up to two full days.

If a power outage lasts for more than 2 days, the control then resets all default programmed parameters to factory preset conditions, and the display will flash "8888" for default. The display will continue to flash until the control is reprogrammed. Default conditions are outlined in Table 2.

**TABLE 2 - DEFAULT CONDITIONS**

| | |
|---|---|
| Time of Day | 12:00 A.M. |
| Time of Regeneration | 2:00 A.M. |
| Chlorination | 10 min. |
| Salt Dosage | 10 lb., 9"<br>16 lb., 12" |
| Backwash Time | 10 min. |
| Brine Rinse | 71 min., 9"<br>59 min., 12" |
| Hardness | 20 GPG |
| Regeneration Interval | 3 days |
| Display Blanking | Enabled |
| Display Lock Out | Disabled |

### Soft-Minder® Systems

The microprocessor automatically calculates the gallons of water which can be treated based upon the salt dosage, water hardness and tank size. Numeric enunciator 8 will display the GALLONS TO SIGNAL for regeneration (the portion of the capacity which is held in reserve is not displayed).

As an option GALLONS TO SIGNAL for regeneration can be set directly to override the calculation through numeric enunciator 8. You can increase or decrease the gallons to signal to meet the needs of the application. The conditioner must cycle through a complete regeneration before the gallon override is saved in the microprocessor. NOTICE: *Changing the capacity will effect the reserve capacity. An INCREASE in the gallons capacity will DECREASE your reserve capacity. A DECREASE in the gallons capacity will INCREASE the reserve capacity.*

For units equipped as a Soft-Minder meter, the gallons remaining can be viewed by pressing the STATUS button until the screen is blank. Press the DOWN arrow until the number 15 icon is illuminated. The display must be multiplied by 10 to determine the actual gallons remaining before the unit calls for a regeneration. The regeneration will occur immediately or be delayed until the time of regeneration depending upon the position of dip switch number 6.

### Aqua Sensor® Units

The Culligan Mark 100 softener, when operating with the Aqua Sensor sensing device, has a unique brine rinse detection circuitry built into the microprocessor. During the brine draw/Slow rinse cycle, the Aqua Sensor probe will sense when the brine solution has rinsed from the tank. It will then automatically shift the control into the Fast Rinse/Refill cycle.

To view the length of the last Brine Draw/Slow Rinse cycle, press the STATUS button until the display is blank. Press the DOWN arrow until the number 15 icon is illuminated.

## Regeneration

An immediate regeneration will take place if dip switch number 6 is turned ON and the gallons capacity has reached zero or if the Aqua Sensor sensing device has sent a signal to the circuit board. An immediate regeneration will also take place by pressing the REGEN button twice. The REGEN enunciator will flash during the regeneration cycle.

A delayed regeneration will take place if dip switch number 6 is turned OFF and the gallons capacity has reached zero or if the Aqua Sensor sensing device has sent a signal to the circuit board. A delayed regeneration will also take place if the REGEN button is pushed once. The REGEN enunciator will be lit constantly indicating that a regeneration will take place at the time of regeneration.

## Cycling

The Culligan® Mark 100 control can be indexed through the various regeneration stages.

1. Press the STATUS button until the display is blank. Push the UP arrow. An "H" will appear in the display. The number 11 icon will light up. The control is in the HOME position.

2. Press the REGEN button twice. The REGEN icon will light and blink. Push the UP arrow. A "1" will appear. The unit is now in the BACKWASH position. The numbers to the right of the colon indicates the time remaining for the cycle.

3. Press the UP arrow. A "2" will appear in the display. The control is in the BRINE DRAW/SLOW RINSE cycle.

4. Press the UP arrow. A "3" will appear in the display. The control is now in the FAST RINSE/REFILL cycle.

5. Press the UP arrow. An "H" will appear in the display. The unit is in the HOME position. The REGEN enunciator is no longer blinking.

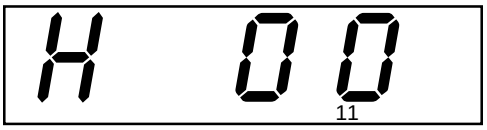
6. Press the STATUS key twice.
   Time-of-Day appears in the display.

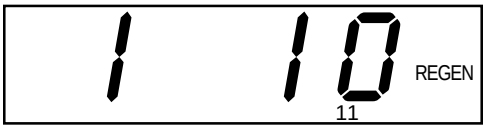
If power is lost during a regeneration cycle, the unit will do one of the following:

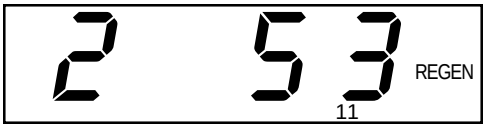
1. If the power loss is less than 2 minutes, the control will continue in the regeneration cycle when power is restored.

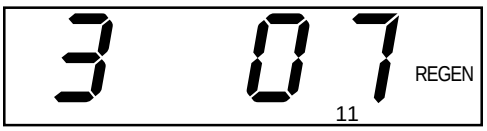
2. If the power loss is between 2 minutes and 4 hours, the control will return to the service position when power is restored and start a new regeneration cycle.

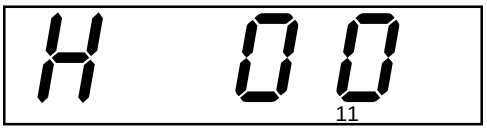
3. For power outages greater than 4 hours, the unit will home itself when power is restored. The unit will then initiate a full regeneration.



## Failure Mode

The Culligan Mark 100 control is equipped to detect a motor or piston which is locked in a frozen position. The AccuSoft™ circuit board will apply power to the motor for 30 seconds. If there is no change in the motor homing or position switch, the control will power down for 90 seconds. The circuit board will repeat this procedure two more times in an attempt to remove the obstruction. If no movement has been detected, the control will permanently power down and a phone icon will appear in the display. The phone indicates that a service call is required to fix the control. To return to the service mode, turn off the power to the unit for 1 full minute and remove the obstruction to the motor or piston.

# Service Check Out

**TABLE 3**

| ACTION | SEGMENT |
|---|---|
| UP KEY | 1 |
| DOWN KEY | 2 |
| REGEN KEY | 3 |
| STATUS KEY | 4 |
| CLOSE HOMING SWITCH | 5 |
| CLOSE PROGRAM SWITCH | 6 |
| FLOW METER PLUGGED IN | 7 |
| AQUA SENSOR PROBE PLUGGED IN | 8 |
| WATER FLOW | 9 (Fluttering) |
| DIP SWITCH 1 | SOFTWARE VERSION |
| DIP SWITCH 2 | “1111” |
| DIP SWITCH 3 | “2222” |
| DIP SWITCH 4 | “3333” |
| DIP SWITCH 5 | “4444” |
| DIP SWITCH 6 | “5555” |
| DIP SWITCH 7 | “6666” |
| DIP SWITCH 8 | “7777” |
| DIP SWITCH 9 | “8888” |
| DIP SWITCH 10 | “9999” |

### Board Diagnostic

To enter the board test mode, turn all the switches to the ON position. All the segments of the board will light until either a key is depressed, an option is changed or a CAM micro switch changes position. Pressing one of the keys, closing a micro switch or turning OFF a dip switch will cause a different segment to light as outlined in Table 3.

A balanced signal should be applied to the Aqua-Sensor® pin connector. This can be done with a set of resistors, with a clean Aqua-Sensor probe and a fully regenerated bed or with the Aqua-Sensor Tester, PN 01-0079-99.

An unbalanced signal will cause the drive motor to run continuously. A balanced signal will cause the motor to stop.

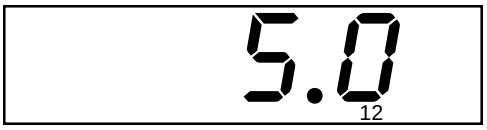
This test can be used to check the integrity of the Aqua-Sensor probe. If the probe is connected to the board and the drive motor runs continuously, the probe should be cleaned and checked.

### Service Check Mode

The service check mode allows one to view the instantaneous flow rate (0.5-10.0 gpm, meter models only), the days since the last regeneration, the number of regenerations in the past fourteen days and either the gallons remaining or the length of the brine rinse cycle on Aqua-Sensor® units. To enter the service check mode, follow these steps:

1. Press the STATUS key until the display is blank.

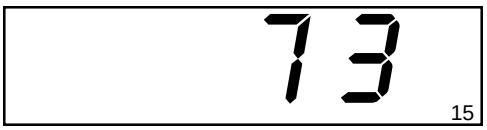
2. Push the DOWN arrow. The number 12 will appear for Soft-Minder® models only. The display reads the gallons per minute flow rate.




3. Press the DOWN arrow. The number 13 lights up. The number in the display indicates the number of regenerations in the last 14 days.

4. Press the DOWN arrow. The number 14 will light up. The number in the display indicates the number of days since last regeneration.

5. Press the DOWN arrow. The number 15 will be displayed. For Aqua-Sensor models, the display indicates the length of the BRINE/RINSE cycle. For Soft-Minder models, the display indicates the gallons remaining before the unit signals for a regeneration (multiply the displayed number by 10). ***This display will not illuminate for Time Clock models.***

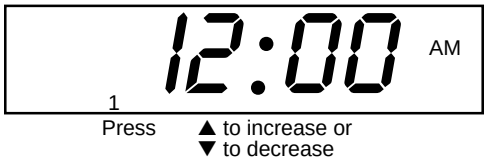


**PROGRAMMING**

Upon plugging in the Culligan® Mark 100 control, the display will flash 8888. To access the programming mode, press the status button. Refer to diagrams below for the programming sequence.

1. Plug in.

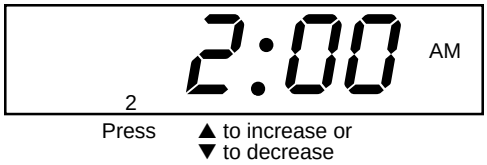
   Press status.
   12:00 will appear.




Displays flashing

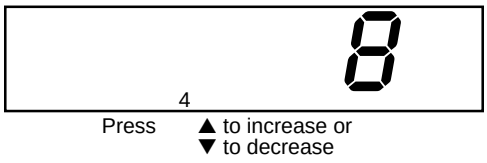
Set **Time-of-Day.** ***ALL MODELS.***

2. Press status.



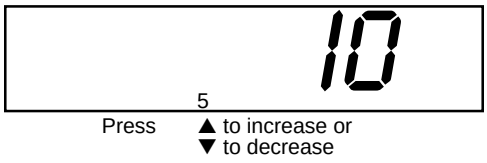

Set **Recharge Time.**
***ALL MODELS.*** **Step 3 is currently not used.**

3. Press status.



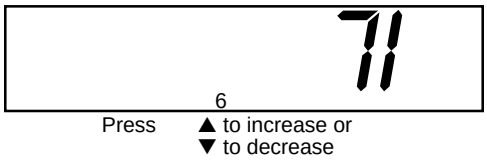

Set **Salt Dosage** (3-15 lb for 9", 5-24 lb for 12"). ***ALL MODELS.***

4. Press status.



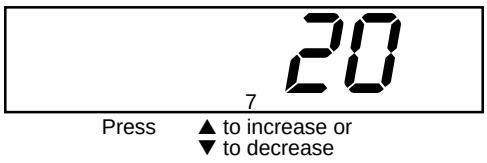

Set **Backwash Time**
(5-40 minutes). ***ALL MODELS.***

5. Press status.



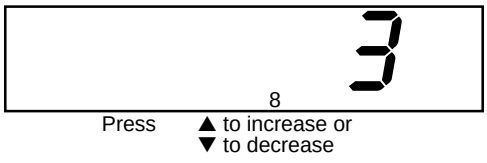

Set **Brine Rinse Time** (37-85 minutes for 9", 35-89 minutes for 12"). ***TIME CLOCK AND METER MODELS ONLY.***

6. Press status.



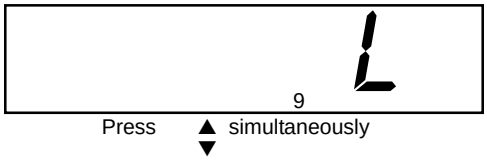

Set **Hardness Level** (1-75 gpg for 9",
1-99 gpg for 12").
***METER MODELS ONLY.***

7. Press status.



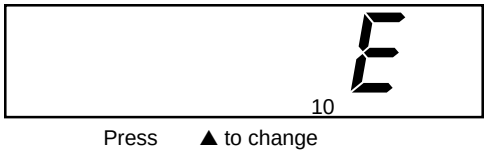

Set **Regeneration Interval** (1-42 days).
***TIME CLOCK MODELS ONLY.***
Set **Gallons To Signal** (10-99990).
***METER MODELS ONLY*** (Multiply displayed number by 10).

8. Press status.




Set **LOCK** or **UNLOCK** feature to prevent tampering with settings.

9. Press status.




Set **ENABLE** or **DISABLE** feature to allow constantly illuminated display or a blank display after 1 minute.

## TABLE 4A - CAPACITY, 9" AQUA-SENSOR® SENSING DEVICE (GALLONS)

| SALT DOSAGE | "A" DIMENSION | | | | HARDNESS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 150 LB INCH(CM) | 250 LB INCH(CM) | 375 LB INCH(CM) | | 1-5 | 6-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51-55 | 56-60 | 61-65 | 66-70 | 71-75 |
| 8 | 14-3/4 | 9-1/4 | 7-1/2 | TOTAL CAPACITY | 4,900 | 2,450 | 1,633 | 1,225 | 980 | 817 | 700 | 613 | 544 | 490 | 445 | | | | |
| | (37.5) | (23.5) | (19.1) | CAPACITY TO SIGNAL | 3,537 | 1,949 | 1,179 | 1,004 | 707 | 590 | 505 | 442 | 393 | 354 | 322 | | | | |
| 12 | 21-3/4 | 15-3/4 | 11-3/8 | TOTAL CAPACITY | 5,420 | 2,710 | 1,807 | 1,355 | 1,084 | 903 | 774 | 678 | 602 | 546 | 493 | 452 | 417 | 387 | 301 |
| | (55.2) | (40.0) | (26.9) | CAPACITY TO SIGNAL | 3,656 | 1,828 | 1,219 | 914 | 731 | 609 | 522 | 457 | 406 | 366 | 332 | 305 | 281 | 261 | 244 |

## TABLE 4B - CAPACITY, 9" SOFT-MINDER® METER (GALLONS)

| SALT DOSAGE | "A" DIMENSION | | | | HARDNESS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 150 LB INCH(CM) | 250 LB INCH(CM) | 375 LB INCH(CM) | | 1-5 | 6-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51-55 | 56-60 | 61-65 | 66-70 | 71-75 |
| 4 | 7-3/4 | 4-5/8 | 3-1/4 | TOTAL CAPACITY | 3,220 | 1,610 | 1,073 | 805 | 644 | 537 | | | | | | | | | |
| | (19.7) | (11.7) | (8.9) | CAPACITY TO SIGNAL | 2,596 | 1,298 | 849 | 637 | 495 | 412 | | | | | | | | | |
| 8 | 14-3/4 | 9-1/4 | 7-1/2 | TOTAL CAPACITY | 4,900 | 2,450 | 1,633 | 1,225 | 980 | 817 | 700 | 613 | 544 | 490 | 445 | | | | |
| | (37.5) | (23.5) | (19.1) | CAPACITY TO SIGNAL | 3,314 | 1,657 | 1,084 | 813 | 631 | 526 | 442 | 387 | 333 | 300 | 267 | | | | |
| 12 | 21-3/4 | 15-3/4 | 11-3/8 | TOTAL CAPACITY | 4,940 | 2,470 | 1,647 | 1,235 | 966 | 823 | 706 | 618 | 549 | 494 | 449 | 412 | 380 | 353 | 329 |
| | (55.2) | (40.0) | (26.9) | CAPACITY TO SIGNAL | 3,656 | 1,828 | 1,219 | 914 | 731 | 609 | 522 | 457 | 406 | 366 | 332 | 305 | 281 | 261 | 244 |

## TABLE 4C - CAPACITY, 12” TIME CLOCK AND AQUA-SENSOR® SENSING DEVICE (GALLONS)

| SALT DOSAGE | “A” DIMENSION | | | | HARDNESS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 150 LB INCH(CM) | 250 LB INCH(CM) | 375 LB INCH(CM) | | 1-5 | 6-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51-60 | 61-70 | 71-80 | 81-90 | 91-99 |
| 12 | 21-3/4 | 15-3/4 | 11-3/8 | TOTAL CAPACITY | 6,740 | 3,370 | 2,247 | 1,685 | 1,348 | 1,123 | 963 | 843 | 749 | 674 | 562 | | | | |
| | (56.2) | (40.0) | (28.9) | CAPACITY TO SIGNAL | 4,542 | 2,271 | 1,514 | 1,136 | 908 | 757 | 649 | 568 | 505 | 454 | 379 | | | | |
| 18 | N/A | 24-1/2 | 17-1/4 | TOTAL CAPACITY | 7,660 | 3,830 | 2,553 | 1,915 | 1,532 | 1,277 | 1,094 | 958 | 851 | 766 | 638 | 547 | 479 | 426 | 383 |
| | | (62.2) | (43.8) | CAPACITY TO SIGNAL | 5,200 | 2,600 | 1,733 | 1,300 | 1,040 | 867 | 743 | 650 | 578 | 520 | 433 | 371 | 325 | 289 | 260 |

## TABLE 4D - CAPACITY, 12” SOFT-MINDER® METER (GALLONS)

| SALT DOSAGE | “A” DIMENSION | | | | HARDNESS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 150 LB INCH(CM) | 250 LB INCH(CM) | 375 LB INCH(CM) | | 1-5 | 6-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51-60 | 61-70 | 71-80 | 81-90 | 91-99 |
| 6 | 14-3/4 | 7-3/8 | 5-1/2 | TOTAL CAPACITY | 4,520 | 2,260 | 1,507 | 1,130 | 904 | 753 | 646 | 565 | | | | | | | |
| | (37.5) | (18.7) | (14.0) | CAPACITY TO SIGNAL | 3,495 | 1,748 | 1,143 | 857 | 666 | 555 | 466 | 408 | | | | | | | |
| 12 | 21-3/4 | 15-3/4 | 11-3/8 | TOTAL CAPACITY | 6,740 | 3,370 | 2,247 | 1,685 | 1,348 | 1,123 | 963 | 843 | 749 | 674 | 562 | | | | |
| | (56.2) | (40.0) | (28.9) | CAPACITY TO SIGNAL | 4,832 | 2,416 | 1,580 | 1,185 | 920 | 767 | 644 | 564 | 486 | 437 | 357 | | | | |
| 18 | N/A | 24-1/2 | 17-1/4 | TOTAL CAPACITY | 7,660 | 3,830 | 2,553 | 1,915 | 1,532 | 1,277 | 1,094 | 958 | 851 | 766 | 638 | 547 | 479 | 426 | 383 |
| | | (62.2) | (43.8) | CAPACITY TO SIGNAL | 5,346 | 2,673 | 1,748 | 1,311 | 1,018 | 849 | 713 | 624 | 537 | 484 | 395 | 335 | 286 | 246 | 219 |

# Parts Replacement Guide

Familiarize yourself with the replacement procedures and component parts thoroughly before attempting any repair.

**⚠ WARNING! DISCONNECT ALL ELECTRICAL POWER TO THE UNIT BEFORE SERVICING. BYPASS THE UNIT AND RELIEVE SYSTEM PRESSURE BEFORE ATTEMPTING REPAIR.**

### Circuit Board

To replace the AccuSoft™ circuit board, refer to the parts list and proceed as follows:

1. Remove the timer cover by twisting the four, quarter turn Phillips screws located on the top of the lever.

**⚠ WARNING! ELECTRICAL SHOCK HAZARD. WILL CAUSE PERSONAL INJURY OR DEATH.**

2. Remove the power, microswitch and motor leads from the board .

**⚠ WARNING! TO PREVENT DAMAGE TO THE LEADS, PULL THE LEADS BY GRIPPING THE CONNECTING TERMINALS ONLY.**

3. Remove the five screws holding the board to the timer case (Fig. 2).

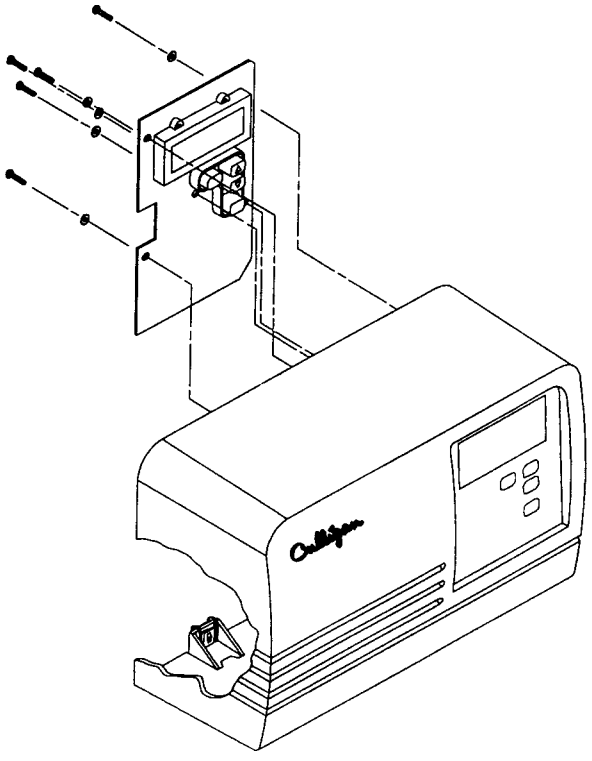


**FIG. 2**

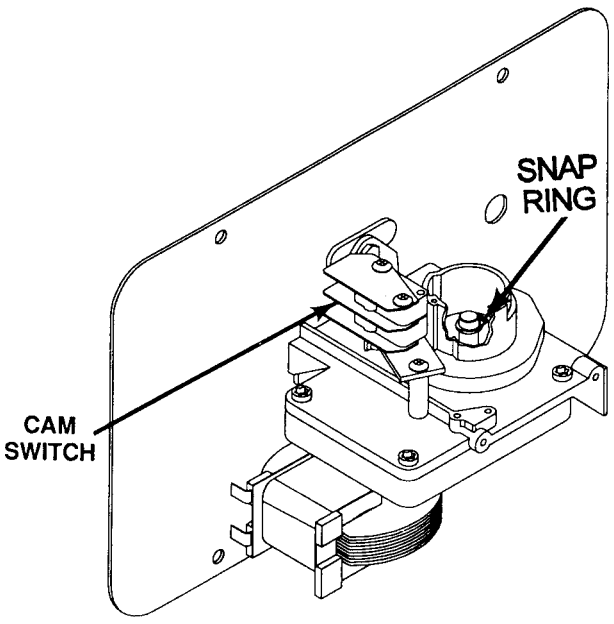



**FIG. 3**

Remove the new circuit board from its protective wrap and install the circuit board by reversing the steps above.

**⚠ CAUTION:** ***Do not touch any surfaces of the circuit board. Electrical static discharges can damage the board. Handle the board by its edges only.***

### Drive Motor Assembly

Follow the circuit board replacement instructions through Step 2 and proceed as follows:

1. Remove the drive motor cam switches (Fig. 3).

2. Remove the snap ring holding the drive motor cam to the cam shaft with snap ring pliers. Lift the cam off the shaft.

3. Remove the retaining clip from the bell crank assembly (Fig. 4).

4. Using a 1/4" hex driver, remove the bolt above the eductor piston assembly.

5. While holding firmly to the motor housing, remove the two Phillips head screws. The motor should be free of the backplate.

6. Reverse the procedure to reassemble. Refer to the wiring diagram (page 19) for the correct wire lead placement.

### Seal Pack Assembly

Follow the instructions for the drive motor through step 5, then continue as follows:

1. While holding the drive motor free of the backplate, firmly put the seal pack assembly from the valve body.

2. Lightly lubricate the o-rings of the replacement seal pack with silicone grease. (Use only silicon grease; petroleum-based lubricants will cause degradation of the rubber components).

3. Reverse the procedure for reassembly. IMPORTANT: DO NOT twist the seal pack upon insertion. This may cut or crimp the outer o-rings.

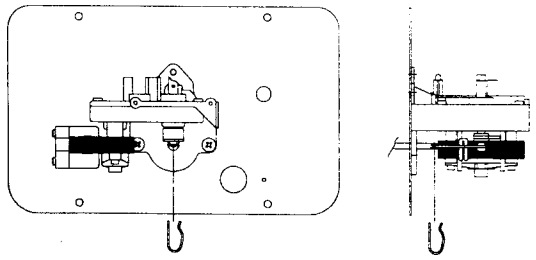


**FIG. 4**

### Eductor Piston Assembly

Follow the instructions for the drive motor through step 5, then continue as follows:

1. While holding the drive motor free of the backplate, firmly pull the eductor piston housing assembly from the valve body.

2. The eductor piston can be removed from the housing at this time. Inspect and replace any damaged o-rings.

3. Reverse the procedure for reassembly. NOTICE: *The eductor sleeves are unique to the softener, filter and Super S™ controls. Refer to the parts list for the proper component.*

### Eductor Assembly

Refer to the parts list and the following instructions:

1. Remove the three eductor plate mounting screws and the eductor plate (Fig. 5).

2. The eductor screen can be removed by lifting it from the eductor body.

3. The eductor body can be removed by grasping one of the projections with the pliers and gently pulling upward.

4. Reverse the procedure to reassemble. Be certain that the replacement eductor body contains the correct eductor nozzle.

**TABLE 5**

| Model | Eductor Nozzle |
|---|---|
| Culligan® Mark 100, 9” | Blue |
| Culligan Mark 100, 12” | White |

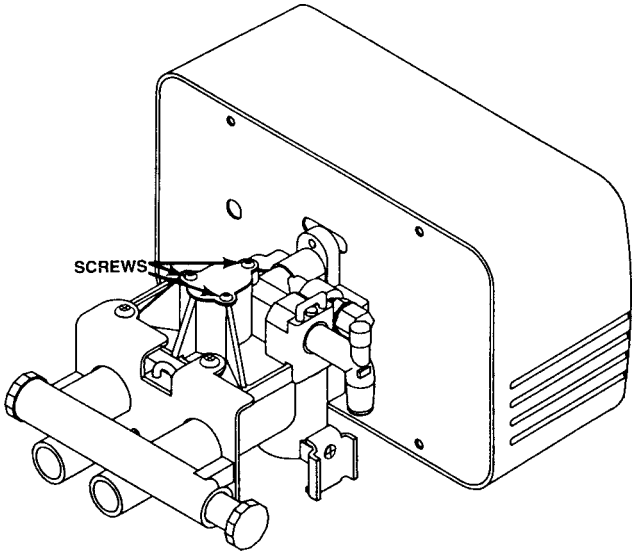



**FIG. 5**

### Backwash Flow Control

Refer to the parts list and the following instructions:

1. Remove the drain elbow retaining clip from the valve body.

2. Pull the drain elbow from the valve body.

3. Remove the flow control from the valve body control and replace with a control with the correct code number (or letter or color) for control model.

4. Reverse the procedure to reassemble.

**TABLE 6**

| Model | Code |
|---|---|
| Culligan® Mark 100, 9” | 2, Brown |
| Culligan Mark 100, 12” | 3, Dark Green |

# “A” Dimension Charts/Refill Rates

The “A” dimension is the distance from the top of the filter screen of the brine valve chamber to the bottom edge of the lower float when the stem is in the fully raised position.

Refer to Table 7 for the correct “A” dimension (secondary shutoff) for the salt dosages on the water softener models. Adjust the “A” dimension as follows (refer to Fig. 6).

- Lift the brine valve from the brine chamber.
- Find the correct “A” dimension from Table 7.
- While holding the float in the up position, slide the retainers and float to achieve the proper “A” dimension.
- Place the float assembly back in the chamber.

### Refill Flow Control

As shipped from the factory, a 0.45 gpm refill flow control is used to control the refill flow rate. This is the standard refill rate as referenced in Table 7. An optional 0.80 gpm flow control is available (PN 00-4016-23). It is recommended that the 0.80 gpm flow control is used when salt dosages are greater than 15 lb. Replace the flow control as follows:

- Lift the brine valve from the brine chamber.
- Grasp the knurled top of the brine cap and unscrew it.
- Remove the 0.45 gpm flow control and replace with the 0.80 gpm control.
- Screw the top in and place the float back into the chamber.

*NOTICE: When using the 0.80 gpm flow control, shift the #5 dip switch to the OFF position. This enables the fast refill mode for the softener.*

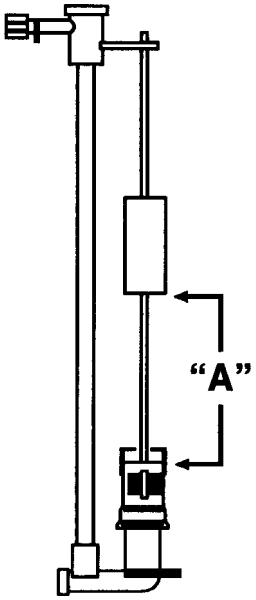



**FIG. 6**

**TABLE 7**

| | REFILL RATE (MIN) | | BRINE TANK "A" DIMENSION | | |
|---|---|---|---|---|---|
| **POUND SALT** | **STANDARD (0.45 gpm)** | **FAST (0.80 gpm)** | **160 LB (13")** | **250 LB (16")** | **375 LB (18")** |
| 3 | 2.55 | 1.44 | 6 | 5-1/4 | 4-1/2 |
| 4 | 3.42 | 1.92 | 7-3/4 | 6-5/8 | 5-1/2 |
| 5 | 4.27 | 2.40 | 9-1/2 | 8 | 6-1/2 |
| 6 | 5.13 | 2.88 | 11-1/4 | 9-3/8 | 7-1/2 |
| 7 | 5.98 | 3.37 | 13 | 10-7/8 | 8-1/2 |
| 8 | 6.84 | 3.85 | 14-3/4 | 12-1/4 | 9-1/2 |
| 9 | 7.69 | 4.33 | 16-1/2 | 13-5/8 | 10-1/2 |
| 10 | 8.55 | 4.81 | 18-1/4 | 15 | 11-1/2 |
| 11 | 9.40 | 5.29 | 20 | 16-3/8 | 12-1/2 |
| 12 | 10.26 | 5.77 | 21-3/4 | 17-3/4 | 13-1/2 |
| 13 | 11.11 | 6.25 | 23-1/2 | 19-1/8 | 14-1/2 |
| 14 | 11.97 | 6.73 | 25-1/4 | 20-1/2 | 15-1/2 |
| 15 | 12.82 | 7.21 | — | 21-7/8 | 16-1/2 |
| 16 | 13.68 | 7.69 | -23 | -1/4 | 17-1/2 |
| 17 | 14.53 | 8.17 | — | 24-5/8 | 18-1/2 |
| 18 | 15.38 | 8.65 | — | 26 | 19-1/2 |
| 19 | 16.24 | 9.13 | — | 27-3/8 | 20-1/2 |
| 20 | 17.09 | 9.62 | — | 28-3/4 | 21-1/2 |
| 21 | 17.95 | 10.10 | — | — | 22-1/2 |
| 22 | 18.8 | 10.58 | — | — | 23-1/2 |
| 23 | 19.66 | 11.06 | — | — | 24-1/2 |
| 24 | 20.51 | 11.57 | — | — | 25-1/2 |

# Flow Rate and Drain Line Charts

**EXTRA BRINE LINE**

This column in the number of feet deducted from the allowable drain line length for each foot the brine line is extended beyond the standard 4-foot length.

**CULLIGAN® MARK 100, 9" WATER CONDITIONER**

| Min. Vac. Ht. | Back Wash gpm | Back Wash Sec./ Gal. | B/W Restric-tor No. | Rinse Rate gpm | Rinse Rate Sec./ Gal. | Fast Rinse Rate gpm | Fast Rinse Rate Sec./ Gal. | Eductor | Pres-sure psi | HEIGHT OF DRAIN DISCHARGE ABOVE FLOOR | | | | | | | | | | | Extra Brine Line |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 4 in. | 1 ft. | 2 ft. | 3 ft. | 4 ft. | 5 ft. | 6 ft. | 7 ft. | 8 ft. | 9 ft. | 10 ft. | |
| | | | | 0.22 | 273 | | | | 20 | | | | | | | | | | | | 0.9 |
| | | | | Min. | Max. | | | | 25 | 33 | 27 | 17 | 7 | | | | | | | | 1.2 |
| | | | | | | | | | 30 | 56 | 50 | 40 | 30 | 20 | 10 | | | | | | 1.9 |
| | | | | | | | | | 35 | 74 | 68 | 58 | 48 | 38 | 28 | 18 | 8 | | | | 2.1 |
| | | | | | | | | | 40 | 88 | 82 | 72 | 62 | 52 | 42 | 32 | 22 | 12 | | | 2.1 |
| | | | | | | | | | 45 | 100 | 94 | 84 | 74 | 64 | 54 | 44 | 34 | 24 | 14 | | 2.2 |
| | | | | | | | | | 50 | 112 | 106 | 96 | 86 | 76 | 66 | 56 | 46 | 36 | 26 | 16 | |
| | | | | | | | | | 55 | 121 | 115 | 105 | 95 | 85 | 75 | 65 | 55 | 45 | 35 | 25 | |
| | | | | | | | | | 60 | 130 | 124 | 114 | 104 | 94 | 84 | 74 | 64 | 54 | 44 | 34 | |
| | | | | | | | | | 65 | 137 | 131 | 121 | 111 | 101 | 91 | 81 | 71 | 61 | 51 | 41 | |
| 19" | 2.0 | 30 | 2 | 0.32 | 188 | 2.0 | 30 | Blue | 70 | 143 | 137 | 127 | 117 | 107 | 97 | 87 | 77 | 67 | 57 | 47 | |
| | | | | Avg. | Avg. | | | | 75 | 147 | 141 | 131 | 121 | 111 | 101 | 91 | 81 | 71 | 61 | 51 | |
| | | | | | | | | | 80 | 149 | 143 | 133 | 123 | 113 | 103 | 93 | 83 | 73 | 63 | 53 | |
| | | | | | | | | | 85 | 151 | 145 | 135 | 125 | 115 | 105 | 95 | 85 | 75 | 65 | 55 | |
| | | | | | | | | | 90 | 153 | 147 | 137 | 127 | 117 | 107 | 97 | 87 | 77 | 67 | 57 | |
| | | | | | | | | | 95 | 156 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | |
| | | | | | | | | | 100 | 159 | 153 | 143 | 133 | 123 | 113 | 103 | 93 | 83 | 73 | 63 | |
| | | | | | | | | | 105 | | | | | | | | | | | | |
| | | | | | | | | | 110 | | | | | | | | | | | | |
| | | | | 0.42 | 142 | | | | 115 | | | | | | | | | | | | |
| | | | | Max. | Min. | | | | 120 | | | | | | | | | | | | |

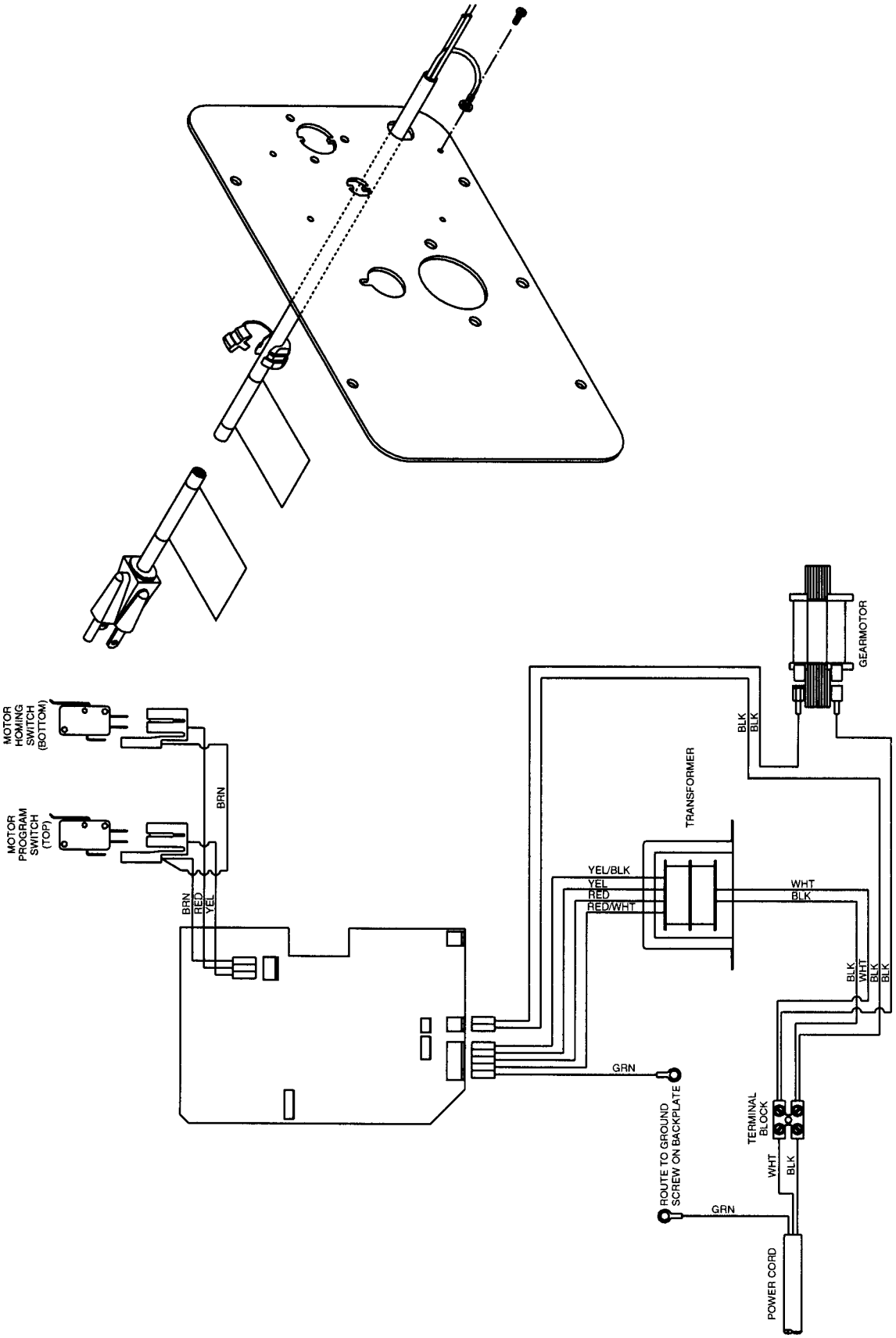
**SALT STORAGE ELEVATION**

For each foot the salt storage tank is lowered below the floor on which the softener stands, it is necessary to deduct 8 feet of drain line from the allowable length shown on the chart. For each foot the salt storage tank is elevated above the floor on which the softener stands, the height of drain discharge can be raised 2 inches, or the total length of the drain line can be increased 4 feet. In either case, deduction must also be made for extra feet of brine line length in excess of the standard 4 feet. For this deduction, use column entitled, "EXTRA BRINE LINE".

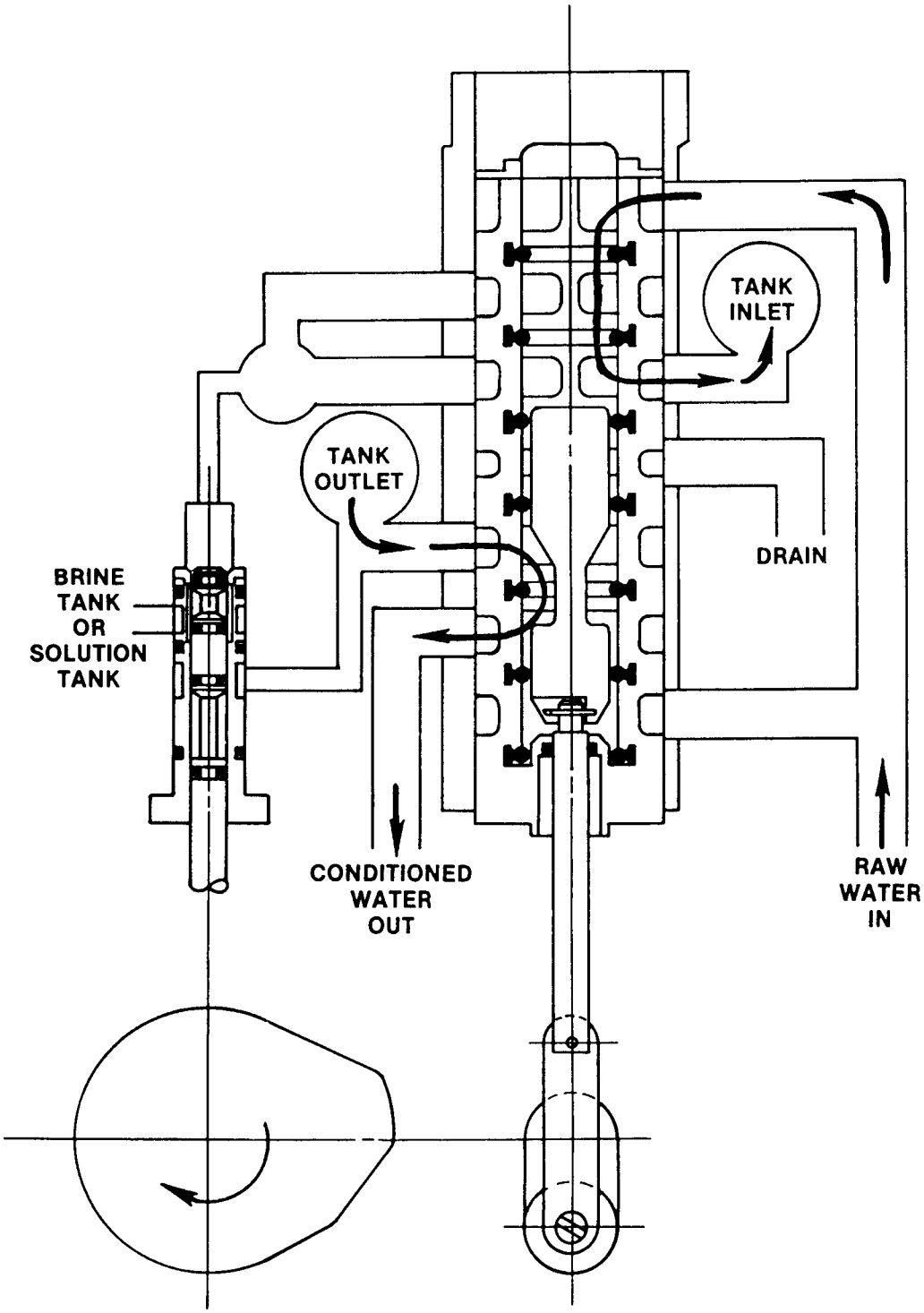
**CULLIGAN® MARK 100, 12" WATER CONDITIONER**

| Min. Vac. Ht. | Back Wash gpm | Back Wash Sec./ Gal. | B/W Restric-tor No. | Rinse Rate gpm | Rinse Rate Sec./ Gal. | Fast Rinse Rate gpm | Fast Rinse Rate Sec./ Gal. | Eductor | Pres-sure psi | HEIGHT OF DRAIN DISCHARGE ABOVE FLOOR | | | | | | | | | | | Extra Brine Line |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 4 in. | 1 ft. | 2 ft. | 3 ft. | 4 ft. | 5 ft. | 6 ft. | 7 ft. | 8 ft. | 9 ft. | 10 ft. | |
| | | | | 0.42 | 142 | | | | 20 | 5 | | | | | | | | | | | 0.9 |
| | | | | Min. | Max. | | | | 25 | 18 | 12 | | | | | | | | | | 1.0 |
| | | | | | | | | | 30 | 44 | 38 | 28 | 18 | | | | | | | | 1.1 |
| | | | | | | | | | 35 | 62 | 56 | 46 | 36 | 26 | 16 | 6 | | | | | 1.2 |
| | | | | | | | | | 40 | 78 | 72 | 62 | 52 | 42 | 32 | 32 | 12 | | | | 1.4 |
| | | | | | | | | | 45 | 93 | 87 | 77 | 67 | 57 | 47 | 37 | 27 | 17 | 7 | | 1.6 |
| | | | | | | | | | 50 | 103 | 97 | 87 | 77 | 67 | 57 | 47 | 37 | 27 | 17 | 7 | 1.8 |
| | | | | | | | | | 55 | 110 | 104 | 94 | 84 | 74 | 64 | 54 | 44 | 34 | 24 | 14 | 1.8 |
| | | | | | | | | | 60 | 117 | 111 | 101 | 91 | 81 | 71 | 61 | 51 | 41 | 31 | 21 | 2.0 |
| | | | | | | | | | 65 | 122 | 116 | 106 | 96 | 86 | 76 | 66 | 56 | 46 | 36 | 26 | 2.0 |
| 19" | 3.5 | 17 | 3 | 0.75 | 80 | 3.5 | 17 | White | 70 | 129 | 123 | 113 | 103 | 93 | 83 | 73 | 63 | 53 | 43 | 33 | 2.1 |
| | | | | Avg. | Avg. | | | | 75 | 133 | 127 | 117 | 107 | 97 | 87 | 67 | 57 | 47 | 37 | 27 | 2.2 |
| | | | | | | | | | 80 | 138 | 132 | 122 | 112 | 102 | 92 | 82 | 72 | 62 | 52 | 42 | 2.3 |
| | | | | | | | | | 85 | 142 | 136 | 126 | 116 | 106 | 96 | 86 | 76 | 66 | 56 | 46 | 2.4 |
| | | | | | | | | | 90 | 145 | 139 | 129 | 119 | 109 | 99 | 89 | 79 | 69 | 59 | 49 | 2.5 |
| | | | | | | | | | 95 | 147 | 141 | 131 | 121 | 111 | 101 | 91 | 81 | 71 | 61 | 51 | 2.7 |
| | | | | | | | | | 100 | 149 | 143 | 133 | 123 | 113 | 103 | 93 | 83 | 73 | 63 | 53 | 2.9 |
| | | | | | | | | | 105 | 151 | 145 | 135 | 125 | 115 | 105 | 95 | 85 | 75 | 65 | 55 | 3.0 |
| | | | | | | | | | 110 | 153 | 147 | 137 | 127 | 117 | 107 | 97 | 87 | 77 | 67 | 57 | 3.1 |
| | | | | 1.08 | 55 | | | | 115 | | | | | | | | | | | | |
| | | | | Max. | Min. | | | | 120 | | | | | | | | | | | | |

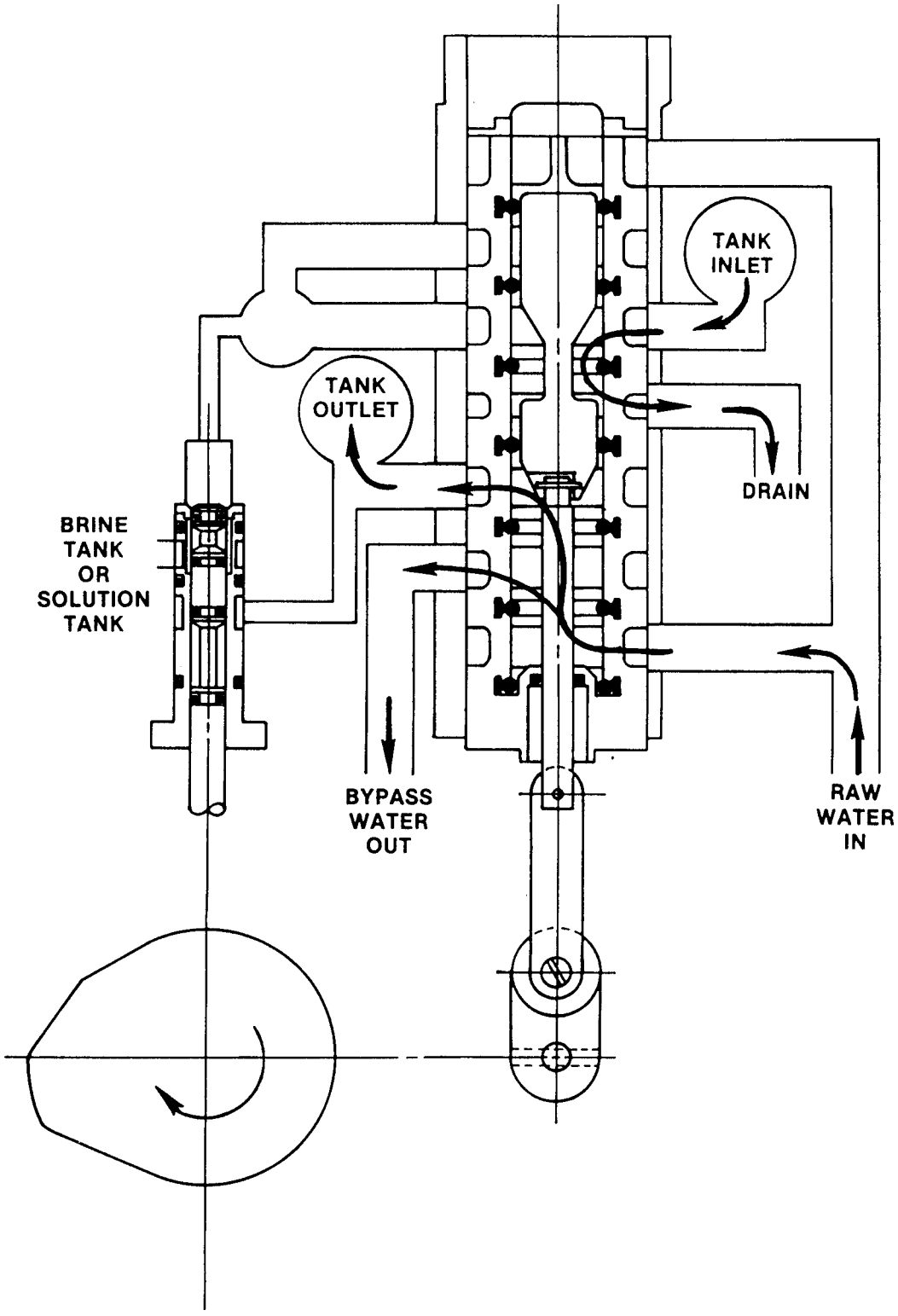
# Wiring Diagram



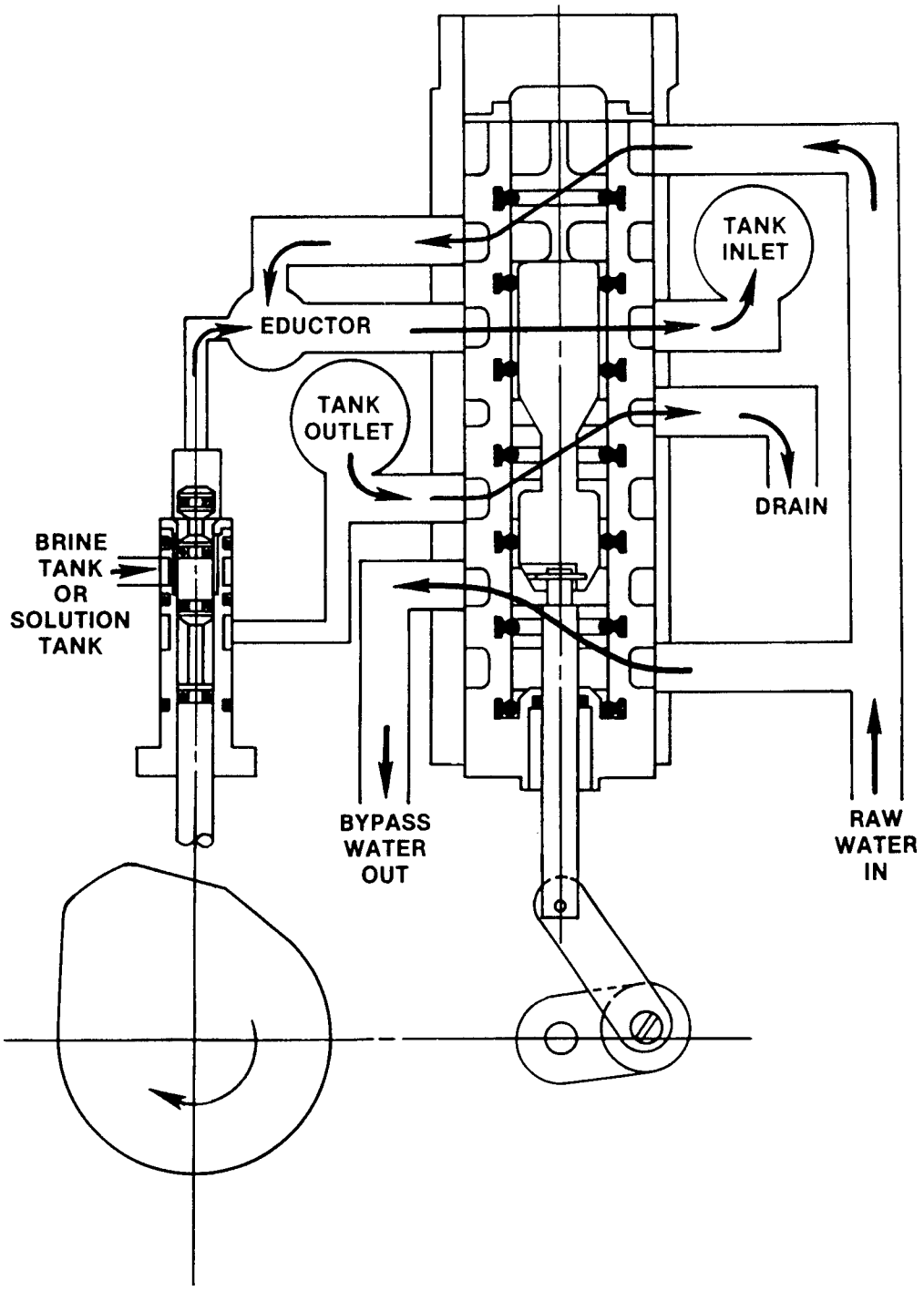
# Flow Charts



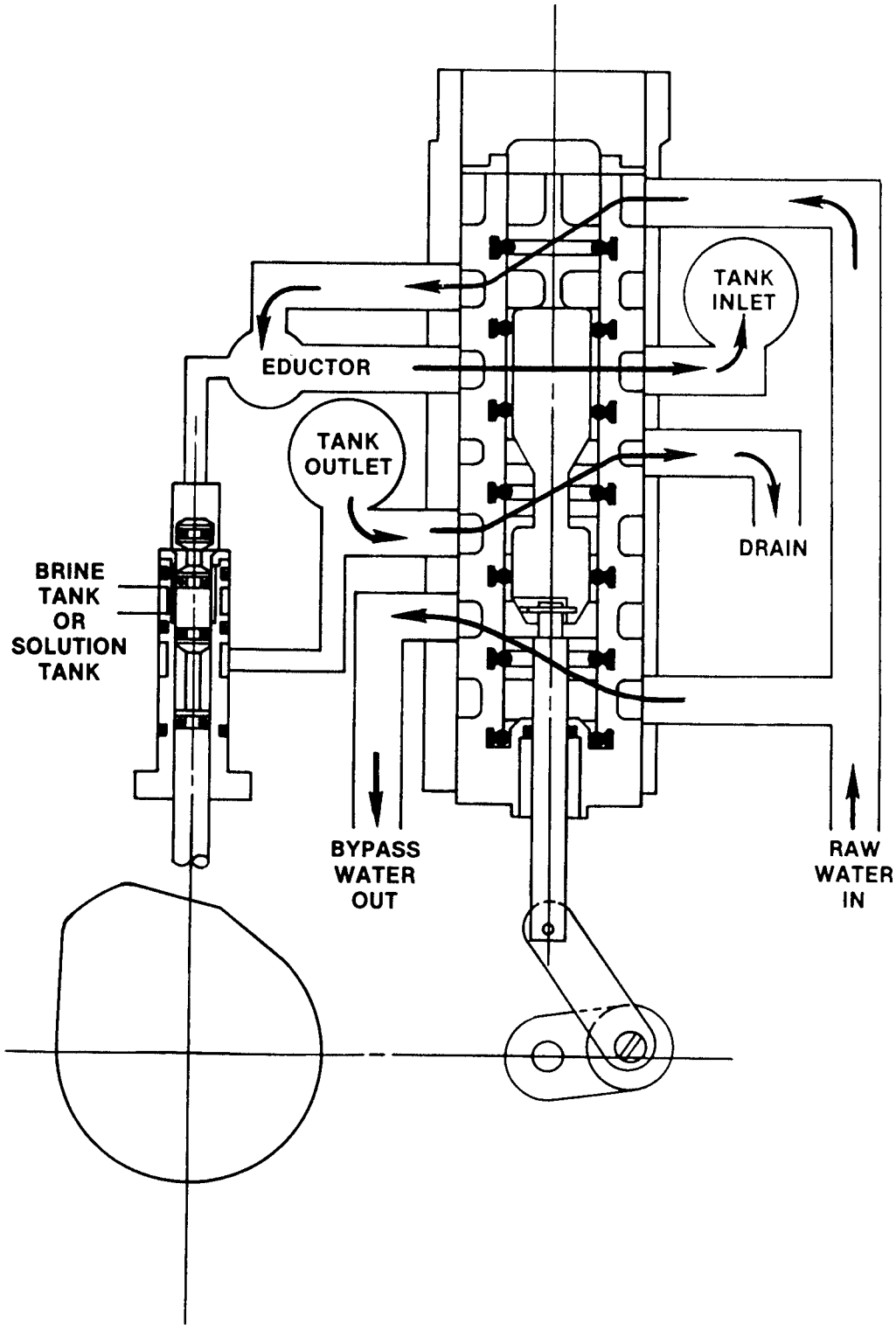

## Service


TANK
INLET
TANK
OUTLET
DRAIN
BRINE
TANK
OR
SOLUTION
TANK
BYPASS
WATER
OUT
RAW
WATER
IN

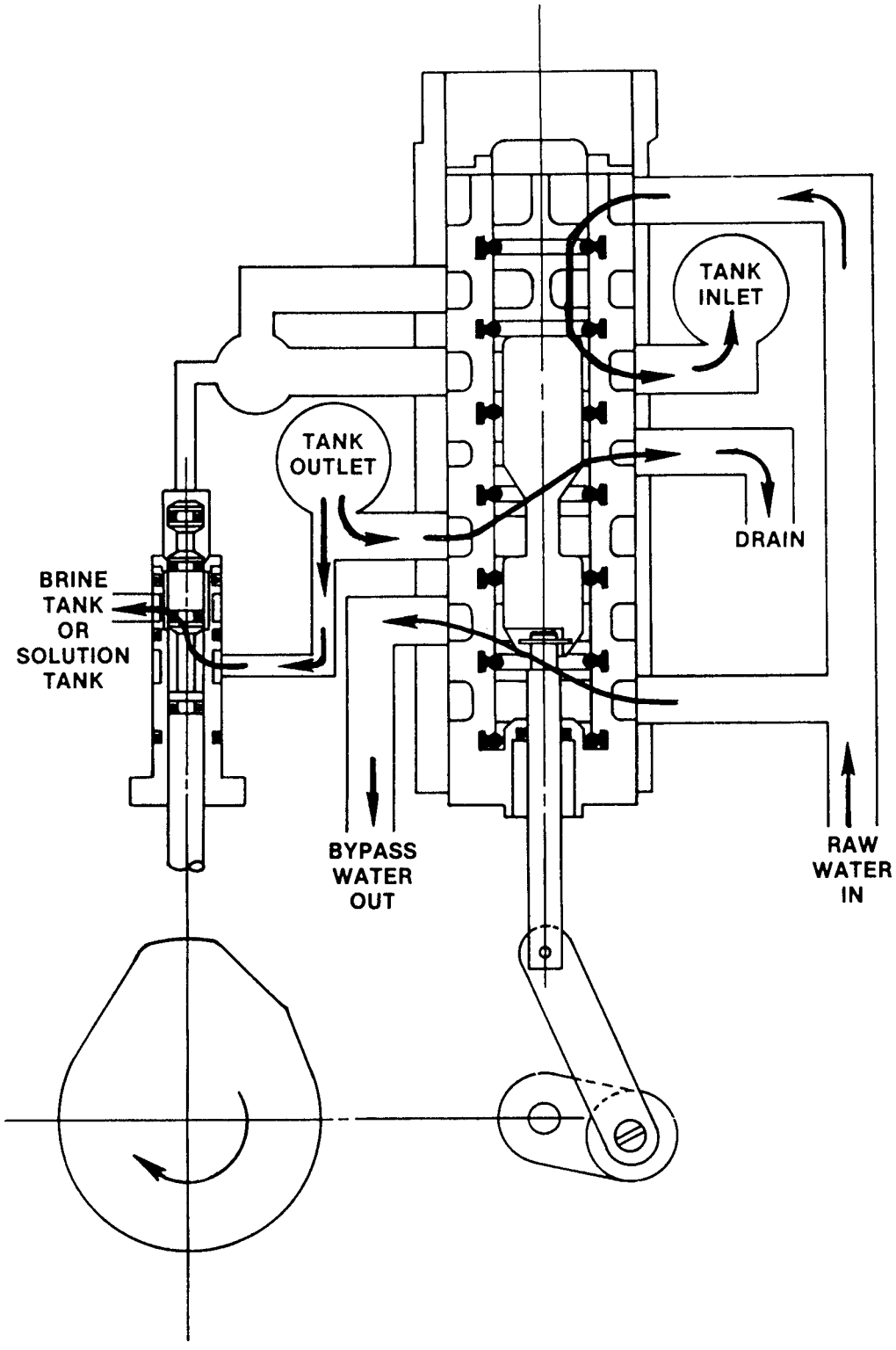
# Backwash




# Regenerant Draw


TANK
INLET
EDUCTOR
TANK
OUTLET
DRAIN
BRINE
TANK
OR
SOLUTION
TANK
BYPASS
WATER
OUT
RAW
WATER
IN

# Slow Rinse




# Rapid Rinse and Refill